

# RF

## TEST REPORT

ISSUED BY  
Shenzhen BALUN Technology Co., Ltd.



FOR

### Roller Shade Driver E1

ISSUED TO  
Konec Solutions Pty Ltd

Level 3, 5 Talavera Rd, Macquarie Park NSW 2113 Australia



|              |                                       |                  |   |
|--------------|---------------------------------------|------------------|---|
| Tested by:   | Zhang Zhenwu                          | Report No.:      | BL-SZ21C0869-601                        |
|              | Zhang Zhenwu                          | EUT Name:        | Roller Shade Driver E1                  |
| Date         | Mar. 09, 2022                         | Model Name:      | RSD-M01                                 |
|              |                                       | Brand Name:      | Aqara                                   |
|              |                                       | Test Standard:   | AS/NZS 4268:2017<br>(refer section 3.1) |
| Approved by: | Jianming Liao<br>(Technical Director) | Test Conclusion: | Pass                                    |
| Date         | Mar. 09, 2022                         | Test Date:       | Jan. 05, 2022 ~ Jan. 20, 2022           |
|              |                                       | Date of Issue:   | Mar. 09, 2022                           |

*NOTE: This test report of test results only related to testing samples, which can be duplicated completely for the legal use with the approval of the applicant; it shall not be reproduced except in full, without the written approval of Shenzhen BALUN Technology Co., Ltd. Any objections should be raised within thirty days from the date of issue. To validate the report, please contact us.*

**Revision History**

| Version        | Issue Date           | Revisions Content    |
|----------------|----------------------|----------------------|
| <u>Rev. 01</u> | <u>Mar. 09, 2022</u> | <u>Initial Issue</u> |

**TABLE OF CONTENTS**

|         |  |    |
|---------|--|----|
| 1       | ADMINISTRATIVE DATA (GENERAL INFORMATION) .....          | 4  |
| 1.1     | Identification of the Testing Laboratory .....           | 4  |
| 1.2     | Identification of the Responsible Testing Location ..... | 4  |
| 1.3     | Laboratory Condition .....                               | 4  |
| 1.4     | Announce .....   | 4  |
| 2       | PRODUCT INFORMATION .....                                | 5  |
| 2.1     | Applicant Information .....                              | 5  |
| 2.2     | Manufacturer Information .....                           | 5  |
| 2.3     | Factory Information .....                                | 5  |
| 2.4     | General Description for Equipment under Test (EUT) ..... | 5  |
| 2.5     | Technical Information .....                              | 6  |
| 2.6     | Additional Instructions .....                            | 7  |
| 3       | SUMMARY OF TEST RESULTS .....                            | 8  |
| 4       | GENERAL TEST CONFIGURATIONS .....                        | 10 |
| 4.1     | Test Environments .....                                  | 10 |
| 4.2     | Test Equipment List .....                                | 10 |
| 4.3     | Test Software List .....                                 | 10 |
| 4.4     | Measurement Uncertainty .....                            | 11 |
| 4.5     | Description of Test Setup .....                          | 11 |
| 5       | Test Type and Test Results .....                         | 14 |
| 5.1     | Transmitter Parameters .....                             | 14 |
| 5.2     | Receiver Parameters .....                                | 26 |
| 5.3     | Other Parameters .....                                   | 31 |
| ANNEX A | TEST RESULT .....  | 32 |
| A.1     | RF output power .....                                    | 32 |
| A.2     | Power spectral density .....                             | 34 |
| A.3     | Duty Cycle, Tx-sequence, Tx-gap .....                    | 35 |

|         |  |    |
|---------|--|----|
| A.4     | Accumulated Transmit Time, Frequency Occupation and Hopping Sequence ..... | 35 |
| A.5     | Hopping Frequency Separation .....   | 35 |
| A.6     | Medium Utilization (MU) factor.....  | 35 |
| A.7     | Adaptivity.....  | 35 |
| A.8     | Occupied Channel Bandwidth.....  | 36 |
| A.9     | Transmitter unwanted emissions in the out-of-band domain .....             | 37 |
| A.10    | Transmitter unwanted emissions in the spurious domain.....                 | 38 |
| A.11    | Receiver Spurious Emissions .....  | 43 |
| A.12    | Receiver Blocking.....   | 48 |
| ANNEX B | TEST SETUP PHOTOS .....  | 49 |
| ANNEX C | EUT EXTERNAL PHOTOS .....  | 49 |
| ANNEX D | EUT INTERNAL PHOTOS.....   | 49 |

# 1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

## 1.1 Identification of the Testing Laboratory

|              |   |
|--------------|---|
| Company Name | Shenzhen BALUN Technology Co., Ltd.   |
| Address      | Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China |
| Phone Number | +86 755 6685 0100   |

## 1.2 Identification of the Responsible Testing Location

|               |   |
|---------------|---|
| Test Location | Shenzhen BALUN Technology Co., Ltd.   |
| Address       | Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China   |
| Description   | All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055 |

## 1.3 Laboratory Condition

|                           |                   |
|---------------------------|-------------------|
| Ambient Temperature       | 20°C to 35°C      |
| Ambient Relative Humidity | 30% to 75%        |
| Ambient Pressure          | 98 kPa to 102 kPa |

## 1.4 Announce

- (1) The test report reference to the report template version v2.1.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

## 2 PRODUCT INFORMATION

### 2.1 Applicant Information

|           |   |
|-----------|---|
| Applicant | Konec Solutions Pty Ltd                                   |
| Address   | Level 3, 5 Talavera Rd, Macquarie Park NSW 2113 Australia |

### 2.2 Manufacturer Information

|              |  |
|--------------|--|
| Manufacturer | Lumi United Technology Co., Ltd.   |
| Address      | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen. China |

### 2.3 Factory Information

|         |  |
|---------|--|
| Factory | Guangdong A-OK Technology Grand Development Co., Ltd.  |
| Address | Hexing Road South Side, Sanhe Economic Development Zone, Huiyang, 516213 Huizhou, Guangdong, PEOPLE'S REPUBLIC OF CHINA. |

### 2.4 General Description for Equipment under Test (EUT)

|   |                        |
|---|------------------------|
| EUT Name                                  | Roller Shade Driver E1 |
| Model Name Under Test                     | RSD-M01                |
| Series Model Name                         | N/A                    |
| Description of Model name differentiation | N/A                    |
| Hardware Version                          | KC131-01 V1.1          |
| Software Version                          | 210115c V1.3           |
| Dimensions (Approx.)                      | N/A                    |
| Weight (Approx.)                          | N/A                    |

## 2.5 Technical Information

|                                   |                       |
|-----------------------------------|-----------------------|
| EUT Type                          | Stand-alone equipment |
| Network and Wireless connectivity | ZigBee                |

The requirement for the following technical information of the EUT was tested in this report:

|                          |  |
|--------------------------|--|
| Modulation Mode          | O-QPSK   |
| Frequency Range          | The frequency range used is 2405 MHz – 2480 MHz;<br>The frequency block is 2400 MHz to 2483.5 MHz.                               |
| Number of channel        | 16   |
| Tested Channel           | 11 (2405 MHz), 18 (2440 MHz), 26 (2480 MHz)  |
| Antenna Type             | FPC Antenna  |
| Antenna Gain             | 1.0 dBi (In test items related to antenna gain, the final results reflect this figure. This value is provided by the applicant.) |
| Beamforming Gain         | N/A  |
| Adaptive or non-adaptive | Non-Adaptive   |
| LBT Based                | Non-LBT  |
| The Max RF Output power  | 9.8 dBm  |
| Receiver Category        | 2  |

## 2.6 Additional Instructions

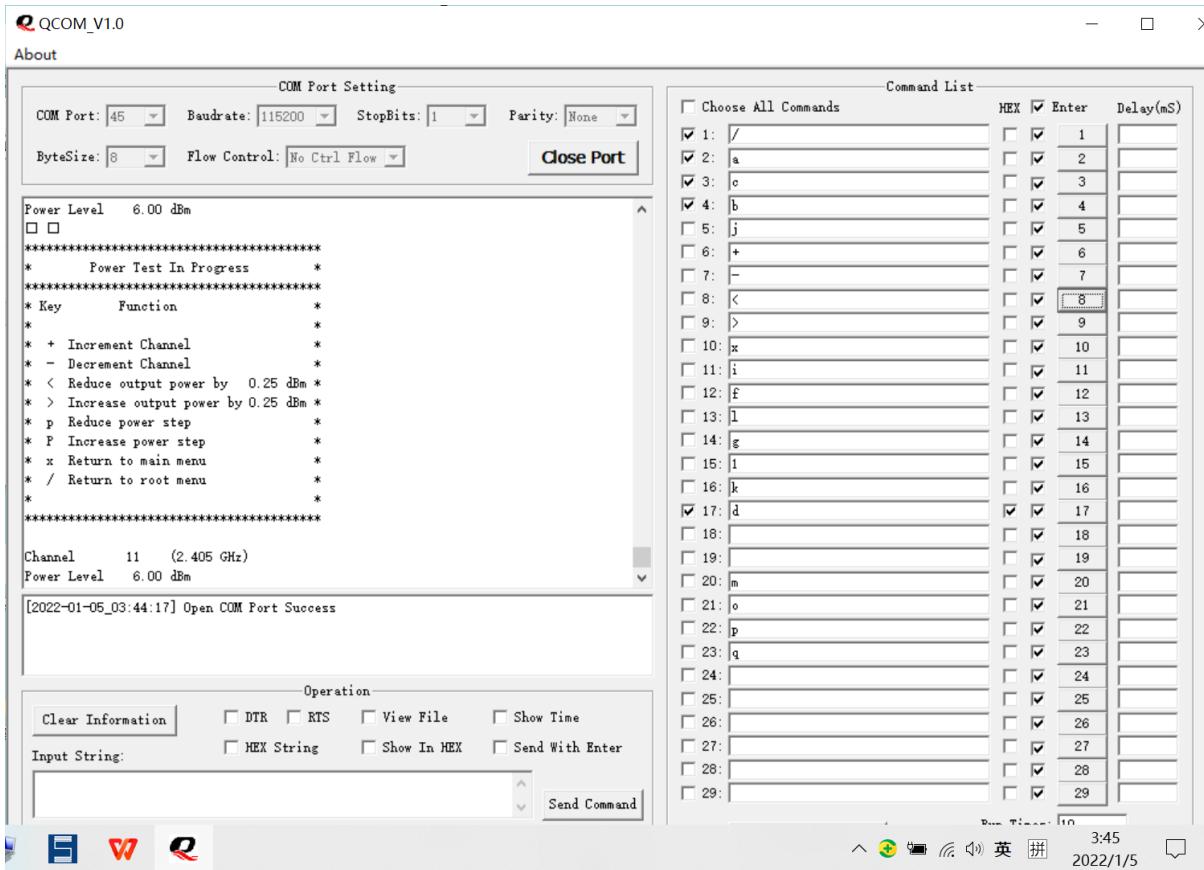
EUT Software Settings:

|      |  |
|------|--|
| Mode | <input checked="" type="checkbox"/> Special software is used.<br>The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually. |
|------|--|

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

| Power level setup in software                  |             |                 |          |
|--|-------------|-----------------|----------|
| Test Software Version                          | QCOM        |                 |          |
| Support Units<br>(Software installation media) | Description | Manufacturer    | Model    |
|  | Notebook    | HP              | N/A      |
| Mode   | Channel     | Frequency (MHz) | Soft Set |
| O-QPSK   | 11          | 2405            | 6.00     |
|  | 18          | 2440            | 6.00     |
|  | 26          | 2480            | 6.50     |

Run Software:



### 3 SUMMARY OF TEST RESULTS

| No. | Identity                         | Document Title   |
|-----|----------------------------------|--|
| 1   | AS/NZS 4268:2017                 | Radio equipment and systems - Short range devices - Limits and methods of measurement  |
| 2   | ETSI EN 300 328 V2.2.2 (2019-07) | Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum |

Test items and the results are as follows:

| Report Section  | Standard Rule        | Description  | Channel         | Test Result | Verdict | Remark                                   |
|---|----------------------|--|-----------------|-------------|---------|--|
| <b>Transmitter Parameters</b>   |                      |  |                 |             |         |  |
| 5.1.1   | 4.3.1.2<br>4.3.2.2   | RF output power  | Low/Middle/High | ANNEX A.1   | Pass    | --                                       |
| 5.1.2   | 4.3.2.3              | Power Spectral Density   | Low/Middle/High | ANNEX A.2   | Pass    | Note <sup>4</sup>                        |
| 5.1.3   | 4.3.1.3<br>4.3.2.4   | Duty Cycle, Tx-sequence, Tx-gap                                      | N/A             | ANNEX A.3   | N/A     | Note <sup>2</sup> ,<br>Note <sup>7</sup> |
| 5.1.4   | 4.3.1.4              | Accumulated Transmit Time, Frequency Occupation and Hopping Sequence | --              | ANNEX A.4   | N/A     | Note <sup>5</sup>                        |
| 5.1.5   | 4.3.1.5              | Hopping Frequency Separation   | --              | ANNEX A.5   | N/A     | Note <sup>5</sup>                        |
| 5.1.6   | 4.3.1.6<br>4.3.2.5   | Medium Utilization (MU) factor                                       | N/A             | ANNEX A.6   | N/A     | Note <sup>2</sup> ,<br>Note <sup>7</sup> |
| 5.1.7   | 4.3.1.7<br>4.3.2.6   | Adaptivity   | N/A             | ANNEX A.7   | N/A     | Note <sup>2</sup> ,<br>Note <sup>3</sup> |
| 5.1.8   | 4.3.1.8<br>4.3.2.7   | Occupied Channel Bandwidth   | Low/High        | ANNEX A.8   | Pass    | --                                       |
| 5.1.9   | 4.3.1.9<br>4.3.2.8   | Transmitter unwanted emissions in the out-of-band domain             | Low/High        | ANNEX A.9   | Pass    | --                                       |
| 5.1.10  | 4.3.1.10<br>4.3.2.9  | Transmitter unwanted emissions in the spurious domain                | Low/High        | ANNEX A.10  | Pass    | --                                       |
| <b>Receiver Parameters</b>  |                      |  |                 |             |         |  |
| 5.2.1   | 4.2.3.2              | Receiver categories  | --              | --          | --      | --                                       |
| 5.2.2   | 4.3.1.11<br>4.3.2.10 | Receiver spurious emissions  | Low/High        | ANNEX A.11  | Pass    | --                                       |
| 5.2.3   | 4.3.1.12<br>4.3.2.11 | Receiver Blocking  | Low/High        | ANNEX A.12  | Pass    | --                                       |
| <b>Other Parameters</b>   |                      |  |                 |             |         |  |
| 5.3.1   | 4.3.1.13<br>4.3.2.12 | Geo-location capability  | --              | --          | N/A     | Note <sup>6</sup>                        |
| Note <sup>1</sup> : This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.  |                      |  |                 |             |         |  |
| Note <sup>2</sup> : This test doesn't apply for the EUT which has the RF Output power is less than 10 dBm e.i.r.p.  |                      |  |                 |             |         |  |
| Note <sup>3</sup> : This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode.                                 |                      |  |                 |             |         |  |
| Note <sup>4</sup> : This requirement apply to the equipment is using wide band modulations other than FHSS.   |                      |  |                 |             |         |  |
| Note <sup>5</sup> : This requirement apply to the equipment is using FHSS.  |                      |  |                 |             |         |  |
| Note <sup>6</sup> : This requirement does not apply to devices that do not support Geo-location capability.   |                      |  |                 |             |         |  |
| Note <sup>7</sup> : These requirements apply to non-adaptive frequency hopping equipment or to adaptive frequency hopping equipment operating in a non-adaptive mode. |                      |  |                 |             |         |  |

## 4 GENERAL TEST CONFIGURATIONS

### 4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

|                            |                         |                |  |
|----------------------------|-------------------------|----------------|--|
| Relative Humidity          | 30% to 75%              |                |  |
| Atmospheric Pressure       | 98 kPa to 102 kPa       |                |  |
| Temperature                | NT (Normal Temperature) | +22°C to +25°C |  |
|                            | LT (Low Temperature)    | -10°C          |  |
|                            | HT (High Temperature)   | +40°C          |  |
| Working Voltage of the EUT | NV (Normal Voltage)     | 5.0 V          |  |

### 4.2 Test Equipment List

| Description                       | Manufacturer  | Model       | Serial No.             | Cal. Date  | Cal. Due   |
|-----------------------------------|---------------|-------------|------------------------|------------|------------|
| Spectrum Analyzer                 | ROHDE&SCHWARZ | FSV-30      | 103118                 | 2021.08.09 | 2022.08.08 |
| Spectrum Analyzer                 | KEYSIGHT      | N9020A      | MY56060183             | 2021.09.08 | 2022.09.07 |
| Vector Signal Generator           | ROHDE&SCHWARZ | SMBV100A    | 260592                 | 2021.01.27 | 2022.01.26 |
| Signal Generator                  | ROHDE&SCHWARZ | SMB100A     | 177746                 | 2021.08.24 | 2022.08.23 |
| Switch Unit with OSP-B157         | ROHDE&SCHWARZ | OSP120      | 101270                 | 2021.06.01 | 2022.05.31 |
| Bluetooth Signaling Unit          | ROHDE&SCHWARZ | CMW270      | 100607                 | 2021.06.01 | 2022.05.31 |
| Bluetooth Signaling Unit          | ROHDE&SCHWARZ | CMW500      | 142028                 | 2021.06.01 | 2022.05.31 |
| DC Power Supply                   | ITECH         | IT6720      | 60010301071<br>7610007 | 2021.09.22 | 2022.09.21 |
| Temperature Chamber               | AHK           | NTH64-40A   | 1310                   | 2022.01.05 | 2023.01.04 |
| EMI Receiver                      | KEYSIGHT      | N9038A      | MY53220118             | 2021.09.13 | 2022.09.12 |
| Test Antenna-Loop(9 kHz-30 MHz)   | SCHWARZBECK   | FMZB 1519   | 1519-037               | 2021.04.16 | 2024.04.15 |
| Test Antenna-Bi-Log(30 MHz-3 GHz) | SCHWARZBECK   | VULB 9163   | 9163-624               | 2021.08.20 | 2024.08.19 |
| Test Antenna-Horn(1-18 GHz)       | SCHWARZBECK   | BBHA 9120D  | 9120D-1917             | 2019.07.02 | 2022.07.01 |
| Test Antenna-Horn (18-40 GHz)     | A-INFO        | LB-180400KF | J211060273             | 2021.07.02 | 2024.07.01 |
| Anechoic Chamber                  | RAINFORD      | 9m*6m*6m    | N/A                    | 2021.09.04 | 2024.09.03 |

### 4.3 Test Software List

| Description  | Manufacturer  | Software Version | Serial No. |
|--------------|---------------|------------------|------------|
| TS8997 EMC32 | ROHDE&SCHWARZ | V10.00.00        | N/A        |

## 4.4 Measurement Uncertainty

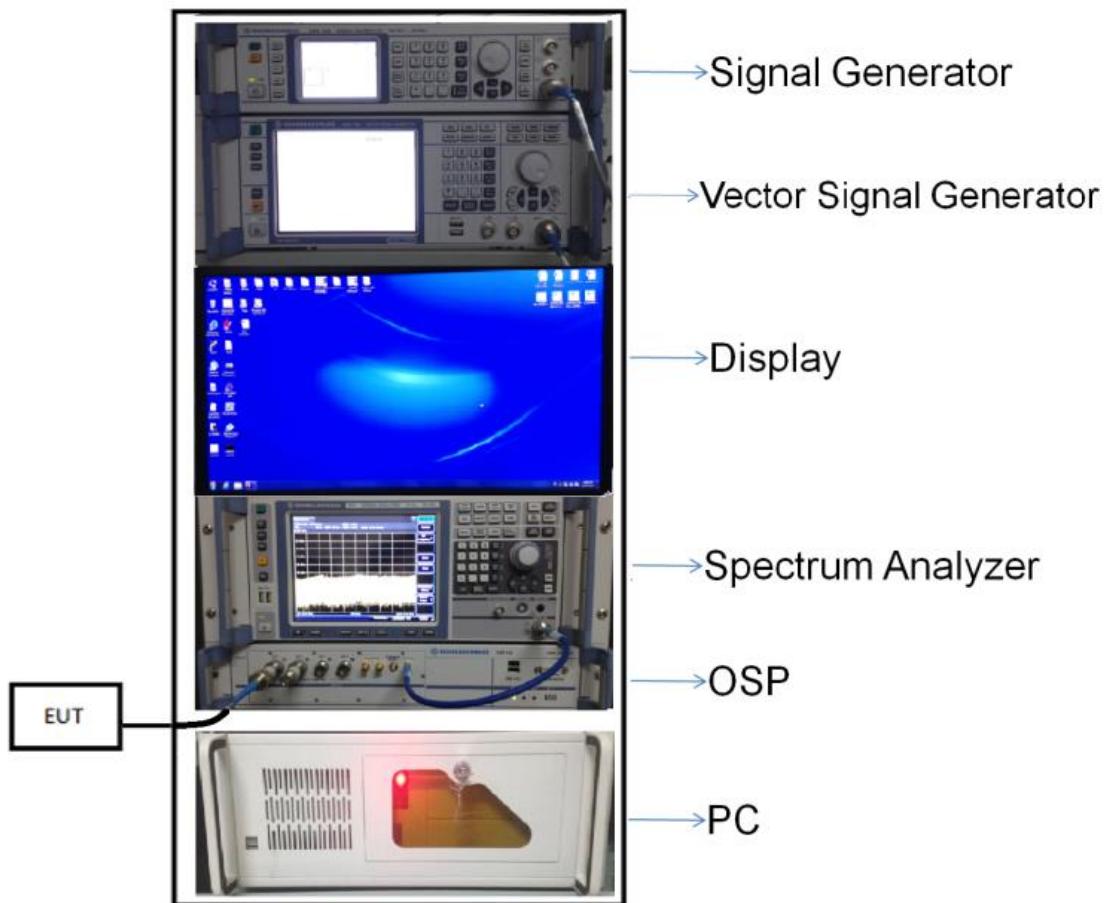
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Parameters                        | Uncertainty |
|-----------------------------------|-------------|
| Occupied Channel Bandwidth        | 3.6 %       |
| RF output power, conducted        | 0.66 dB     |
| Power Spectral Density, conducted | 0.90 dB     |
| Unwanted Emissions, conducted     | 1.78 dB     |
| All emissions, radiated           | 5.36 dB     |
| Temperature                       | 0.82 °C     |
| Humidity                          | 4.1 %       |

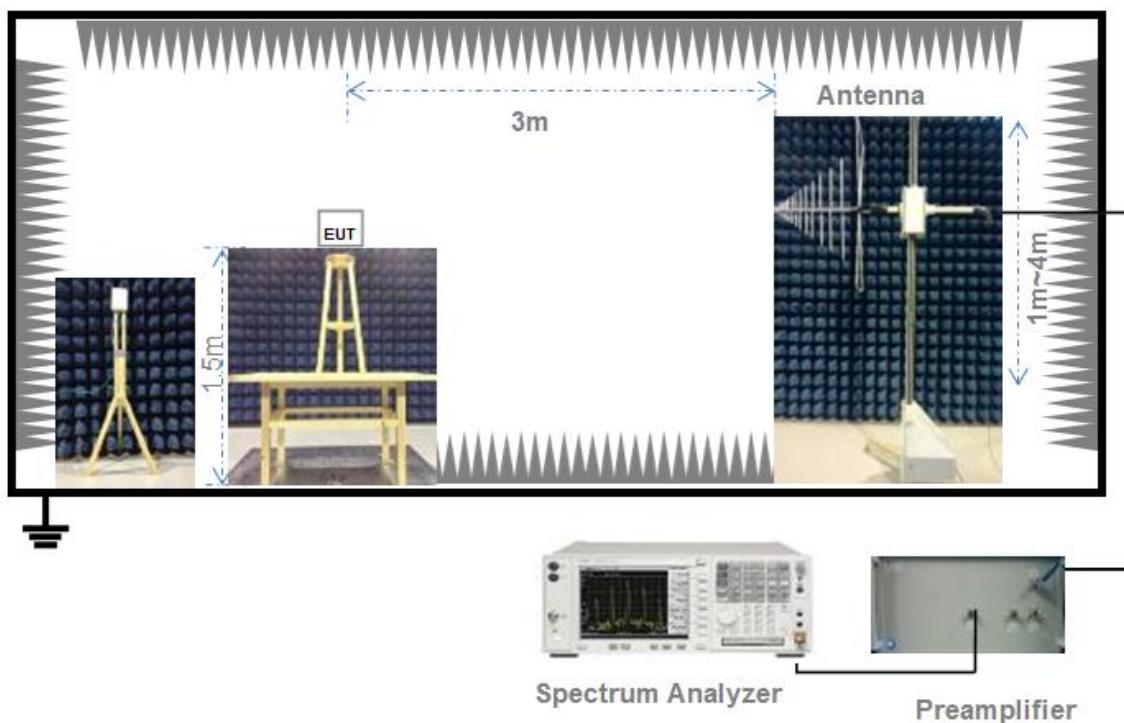
## 4.5 Description of Test Setup

### 4.5.1 For Conducted Test

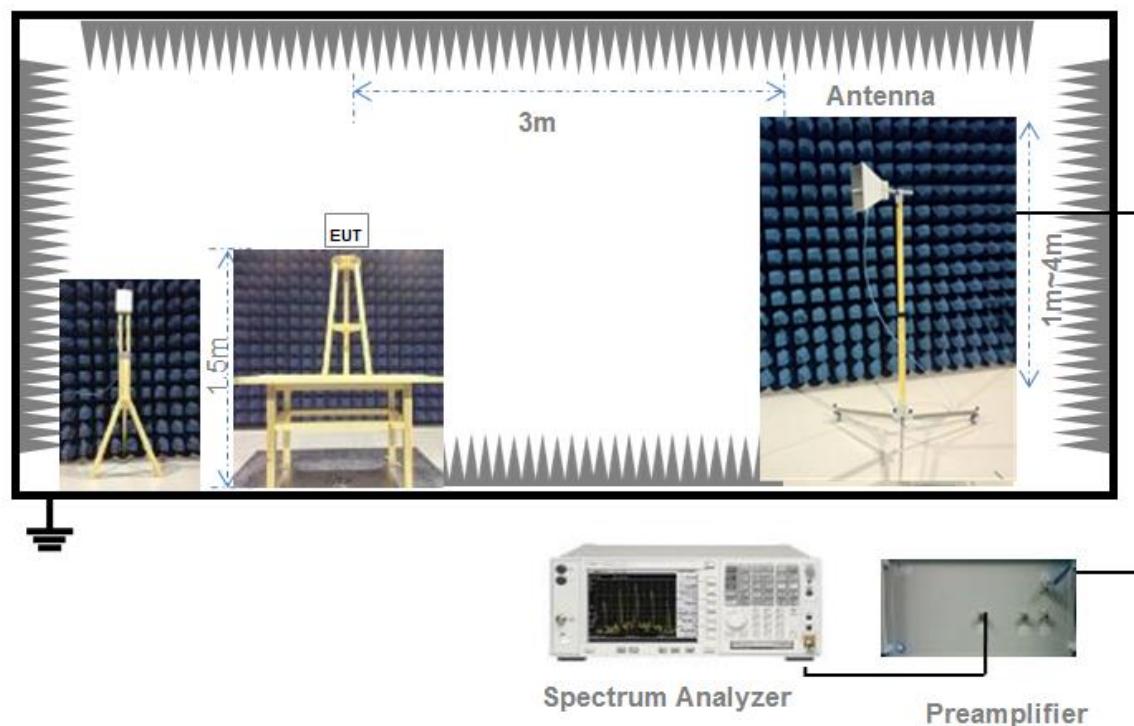


(Diagram 1)

#### 4.5.2 For Radiated Test

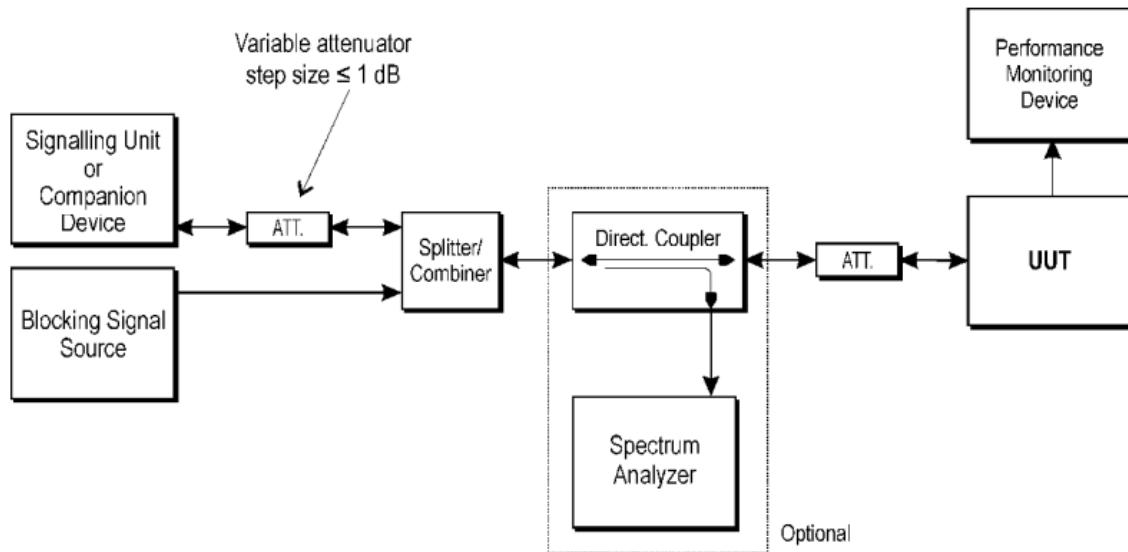


(Diagram 2)



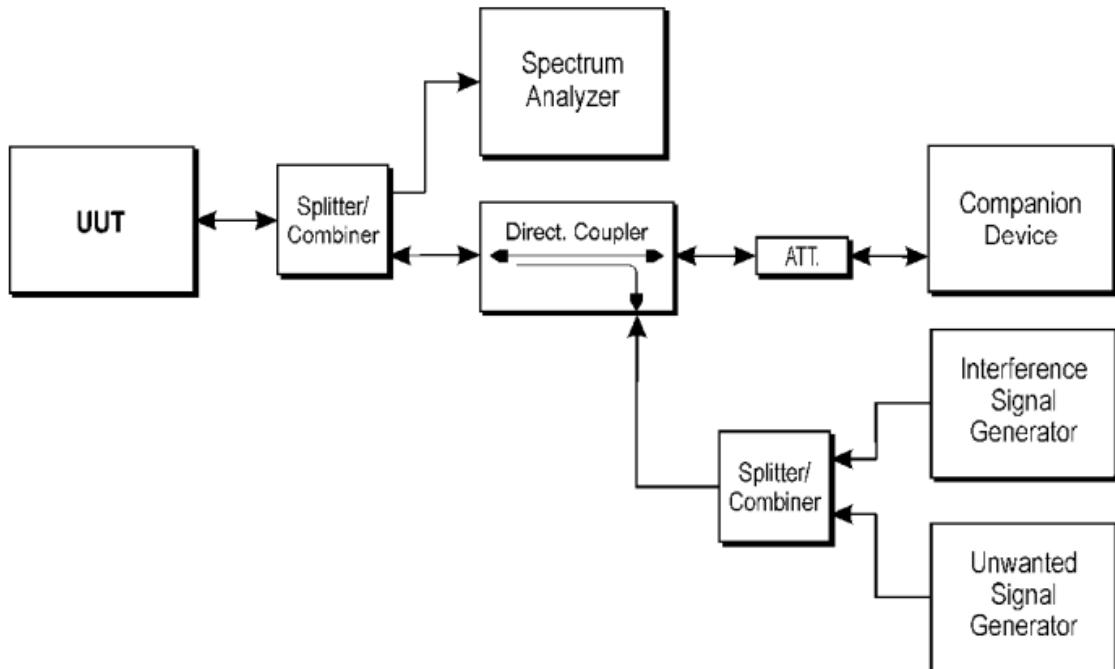
(Diagram 3)

#### 4.5.3 For Receiver Blocking Test



(Diagram 4)

#### 4.5.4 For Adaptivity Test



(Diagram 5)

## 5 Test Type and Test Results

### 5.1 Transmitter Parameters

#### 5.1.1 RF output power

##### 5.1.1.1 Limit

The maximum RF output power shall be equal to or less than 20 dBm.

##### 5.1.1.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

##### 5.1.1.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

##### 5.1.1.4 Test Result

Please refer to ANNEX A.1.

## 5.1.2 Power Spectral Density

### 5.1.2.1 Limit

The maximum Power Spectral Density for non-FHSS equipment is 10 dBm per MHz.

### 5.1.2.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.1.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.3.2.

### 5.1.2.4 Test Result

Please refer to ANNEX A.2.

### 5.1.3 Duty Cycle, Tx-sequence, Tx-gap

#### 5.1.3.1 Limit

The Duty Cycle shall be equal to or less than the maximum value declared by the manufacturer.

The Tx-sequence time shall be equal to or less than 10 ms.

The minimum Tx-gap time following a Tx-sequence shall be equal to the duration of that proceeding Txsequence with a minimum of 3,5 ms.

#### 5.1.3.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

#### 5.1.3.4 Test Result

Please refer to ANNEX A.3.

## 5.1.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

### 5.1.4.1 Limit

The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.

Option 2: The occupation probability for each frequency shall be between  $((1 / U) \times 25\%)$  and 77 % where U is the number of hopping frequencies in use.

### 5.1.4.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.1.4.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.4.2.

### 5.1.4.4 Test Result

Please refer to ANNEX A.4.

## 5.1.5 Hopping Frequency Separation

### 5.1.5.1 Limit

For adaptive frequency hopping systems, the minimum Hopping Frequency Separation shall be 100 kHz.

### 5.1.5.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.1.5.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.5.2.

### 5.1.5.4 Test Result

Please refer to ANNEX A.5.

## 5.1.6 Medium Utilization (MU) factor

### 5.1.6.1 Limit

The maximum Medium Utilization factor for non-adaptive equipment shall be 10 %.

### 5.1.6.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.1.6.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.2.2.

### 5.1.6.4 Test Result

Please refer to ANNEX A.6.

## 5.1.7 Adaptivity

### 5.1.7.1 Limit

#### Adaptive Frequency Hopping

| Requirement   | Operational Mode  |                                |
|---|---|--------------------------------|
|   | Non-LBT based Detect and Avoid  | LBT based Detect and Avoid     |
| Minimum Clear Channel Assessment (CCA) Time   | NA  | 18 us (see Note <sup>1</sup> ) |
| Maximum Channel Occupancy (COT) Time  | 40 ms   | 60 ms                          |
| Minimum Idle Period   | 5% of COT   | 5% of COT                      |
| Extended CCA check  | NA  | NA                             |
| Short Control Signalling Transmissions  | Maximum duty cycle of 10 % within an observation period of 50 ms (see Note <sup>2</sup> ) |                                |
| <p>Note <sup>1</sup>: The CCA time used by the equipment shall be declared by the supplier.</p> <p>Note <sup>2</sup>: Adaptive equipment may or may not have Short Control Signalling Transmissions.</p> <p>Note <sup>3</sup>: The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2.</p> <p>Note <sup>4</sup>: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.</p> |   |                                |

Interference threshold level:

| Maximum transmit power ( $P_H$ )<br>EIRP dBm   | Threshold level (TL)<br>(see notes 1 and 2) |
|--|---|
| 20   | -70 dBm / MHz                               |
| Note <sup>1</sup> : $TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW} / P_{\text{out}})$ (Pout in mW e.i.r.p.).  |   |
| Note <sup>2</sup> : transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). |   |

Unwanted Signal parameters

| Wanted signal mean power from companion device  | Unwanted signal frequency (MHz)           | Unwanted CW signal power (dBm) |
|---|---|--------------------------------|
| sufficient to maintain the link (see Note <sup>2</sup> )  | 2 395 or 2 488,5 (see Note <sup>1</sup> ) | -35 (see Note <sup>3</sup> )   |
| Note <sup>1</sup> : The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz. See clause 5.4.6.1. |   |                                |
| Note <sup>2</sup> : A typical value which can be used in most cases is -50 dBm/MHz.   |   |                                |
| Note <sup>3</sup> : The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.  |   |                                |

Adaptive equipment using modulations other than FHSS

| Requirement  | Operational Mode  |                                |  |   |
|--|---|--------------------------------|--|---|
|  | Non-LBT based Detect and Avoid  | LBT based Detect and Avoid     |  |   |
|  |   | Frame Based Equipment          | Load Based Equipment (CCA using 'energy detect') | Load Based Equipment (CCA not using any of the mechanisms referenced as Note <sup>2</sup> ) |
| Minimum Clear Channel Assessment (CCA) Time  | NA  | 18 us (see Note <sup>1</sup> ) | (see Note <sup>2</sup> )                         | 18 us (see Note <sup>1</sup> )  |
| Maximum Channel Occupancy (COT) Time   | 40 ms   | 1 ms to 10 ms                  | (see Note <sup>2</sup> )                         | 13 ms   |
| Minimum Idle Period  | 5% of COT   | 5% of COT                      | (see Note <sup>2</sup> )                         | NA  |
| Extended CCA check   | NA  | NA                             | (see Note <sup>2</sup> )                         | a random duration in the range between 18 $\mu$ s and at least 160 $\mu$ s                  |
| Short Control Signalling Transmissions   | Maximum duty cycle of 10 % within an observation period of 50 ms (see Note <sup>3</sup> ) |                                |  |   |
| <p>Note<sup>1</sup>: The CCA time used by the equipment shall be declared by the supplier.</p> <p>Note<sup>2</sup>: Load Based Equipment may implement an LBT based spectrum sharing mechanism based on the Clear Channel Assessment (CCA) mode using energy detect, as described in IEEE 802.11™-2012 [i.3] clause 9, clause 10, clause 16, clause 17, clause 19 and clause 20, or in IEEE 802.15.4™-2011 [i.4], clause 4, clause 5 and clause 8</p> <p>Note<sup>3</sup>: Adaptive equipment may or may not have Short Control Signalling Transmissions.</p> <p>Note<sup>4</sup>: The Idle Period is considered to be equal to the CCA or Extended CCA time defined in clause 4.3.2.6.3.2.3, step 1 and step 2.</p> <p>Note<sup>5</sup>: The Idle Period in between transmissions is considered to be the CCA or the Extended CCA check as there are no transmissions during this period.</p> |   |                                |  |   |

Interference threshold level:

| Maximum transmit power ( $P_H$ )<br>EIRP dBm   | Threshold level (TL)<br>(see notes 1 and 2) |
|--|---|
| 20   | -70 dBm / MHz                               |
| Note 1: $TL = -70 \text{ dBm/MHz} + 10 \times \log_{10} (100 \text{ mW} / P_{out})$ (Pout in mW e.i.r.p.).<br>Note 2: transmitter the CCA threshold level (TL) shall be equal or lower than -70 dBm/MHz at the input to the receiver (assuming a 0 dBi receive antenna). |   |

### Unwanted Signal parameters

| Wanted signal mean power from companion device | Unwanted signal frequency (MHz) | Unwanted CW signal power (dBm) |
|--|---------------------------------|--------------------------------|
| sufficient to maintain the link (see note 2)   | 2 395 or 2 488,5 (see note 1)   | -35 (see note 3)               |

Note <sup>1</sup>: The highest frequency shall be used for testing operating channels within the range 2400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483.5 MHz. See clause 5.4.6.1.

Note <sup>2</sup>: A typical value which can be used in most cases is -50 dBm/MHz.

Note <sup>3</sup>: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain.

#### 5.1.7.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.7.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.6.2.

#### 5.1.7.4 Test Result

Please refer to ANNEX A.7.

## 5.1.8 Occupied Channel Bandwidth

### 5.1.8.1 Limit

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band 2400 MHz to 2483.5 MHz.

In addition, for non-adaptive FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than 5 MHz..

In addition, for non-adaptive non-FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

### 5.1.8.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.1.8.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.7.2.

### 5.1.8.4 Test Result

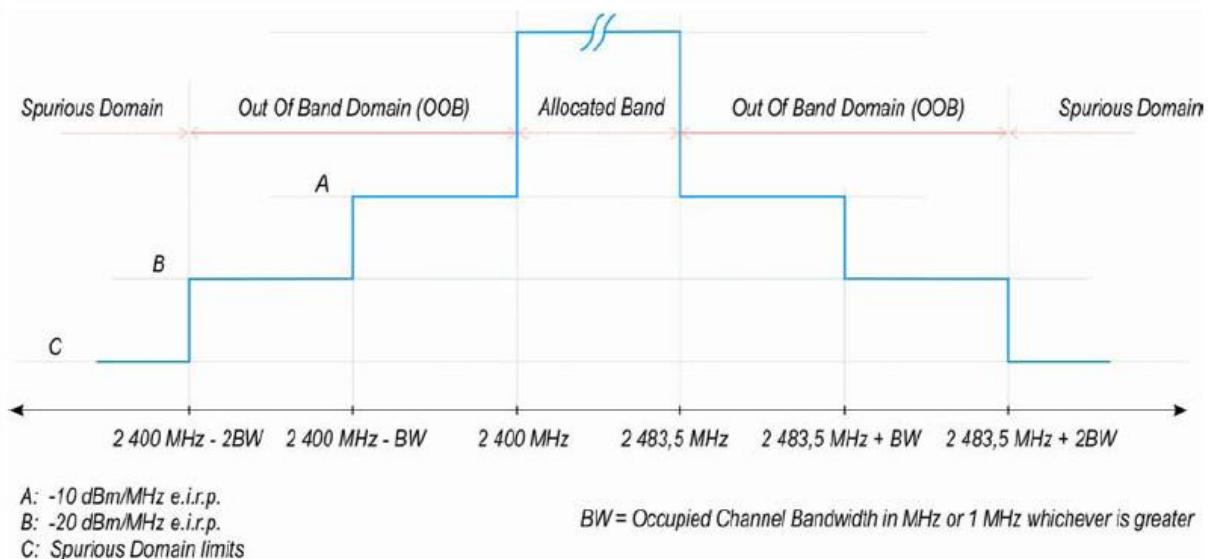
Please refer to ANNEX A.8.

### 5.1.9 Transmitter unwanted emissions in the out-of-band domain

#### 5.1.9.1 Limit

The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1.

NOTE: Within the 2400 M Hz to 2483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement in clause 4.3.1.8.



**Figure 1: Transmit mask**

#### 5.1.9.2 Test Setup

The section 4.5.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

#### 5.1.9.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.8.2.

#### 5.1.9.4 Test Result

Please refer to ANNEX A.9.

### 5.1.10 Transmitter unwanted emissions in the spurious domain

#### 5.1.10.1 Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values in following tables:

| Frequency range     | Maximum power (dBm) | Bandwidth |
|---------------------|---------------------|-----------|
| 30 MHz to 47 MHz    | -36                 | 100 kHz   |
| 47 MHz to 74 MHz    | -54                 | 100 kHz   |
| 74 MHz to 87.5 MHz  | -36                 | 100 kHz   |
| 87.5 MHz to 118 MHz | -54                 | 100 kHz   |
| 118 MHz to 174 MHz  | -36                 | 100 kHz   |
| 174 MHz to 230 MHz  | -54                 | 100 kHz   |
| 230 MHz to 470 MHz  | -36                 | 100 kHz   |
| 470 MHz to 694 MHz  | -54                 | 100 kHz   |
| 694 MHz to 1 GHz    | -36                 | 100 kHz   |
| 1 GHz to 12.75 GHz  | -30                 | 1 MHz     |

#### 5.1.10.2 Test Setup

The section 4.5.1 and 4.5.2 (Diagram 1, 2, 3) for test setup description. The photo of test setup please refer to ANNEX B.

#### 5.1.10.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.9.2.

#### 5.1.10.4 Test Result

Please refer to ANNEX A.10.

## 5.2 Receiver Parameters

### 5.2.1 Receiver categories

There are three different receiver categories for which different receiver requirements and/or corresponding limits apply.

| Receiver Category |   |
|-------------------|---|
| Receiver Category | Definition  |
| Category 1        | Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p.  |
| Category 2        | Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment and non-adaptive with a maximum RF output power of 10 dBm e.i.r.p. |
| Category 3        | Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment and non-adaptive with a maximum RF output power of 0 dBm e.i.r.p.                                   |

## 5.2.2 Receiver Spurious Emissions

### 5.2.2.1 Limit

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

The spurious emissions of the transmitter shall not exceed the values in following tables for the EUT in this report.

| Frequency range    | Maximum power (dBm) | Bandwidth |
|--------------------|---------------------|-----------|
| 30 MHz to 1 GHz    | -57                 | 100 KHz   |
| 1 GHz to 12.75 GHz | -47                 | 1 MHz     |

### 5.2.2.2 Test Setup

The section 4.5.1 (Diagram 1) for test setup description. The photo of test setup please refer to ANNEX B.

### 5.2.2.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.10.2.

### 5.2.2.4 Test Result

Please refer to ANNEX A.11.

## 5.2.3 Receiver Blocking

### 5.2.3.1 Limit

While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in next table.

Receiver Category 1 equipment

| Wanted signal mean power from companion device (dBm)<br>(see notes 1 and 4)                | Blocking signal frequency(MHz) | Blocking signal power (dBm)<br>(see note 4) | Type of blocking signal |
|--|--------------------------------|---|-------------------------|
| (-133 dBm + 10 × log <sub>10</sub> (OCBW))<br>or -68 dBm whichever is less<br>(see note 2) | 2 380                          | -34   | CW                      |
|  | 2 504                          | -34   | CW                      |
| (-139 dBm + 10 × log <sub>10</sub> (OCBW))<br>or -74 dBm whichever is less<br>(see note 3) | 2 300                          | -34   | CW                      |
|  | 2 330                          | -34   | CW                      |
|  | 2 360                          | -34   | CW                      |
|  | 2 524                          | -34   | CW                      |
|  | 2 584                          | -34   | CW                      |
|  | 2 674                          | -34   | CW                      |

Note <sup>1</sup>: OCBW is in Hz.

Note <sup>2</sup>: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P<sub>min</sub> + 26 dB where P<sub>min</sub> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. P<sub>min</sub> is the minimum level of wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

Note <sup>3</sup>: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P<sub>min</sub> + 20 dB where P<sub>min</sub> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

Note <sup>4</sup>: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

### Receiver Category 2 equipment

| Wanted signal mean power from companion device (dBm)<br>(see notes 1 and 3)                            | Blocking signal frequency (MHz) | Blocking signal power (dBm)<br>(see note 3) | Type of blocking signal |
|--|---------------------------------|---|-------------------------|
| (-139 dBm + 10 × log <sub>10</sub> (OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2) | 2 380                           | -34   | CW                      |
|  | 2 504                           | -34   | CW                      |
|  | 2 300                           | -34   | CW                      |
|  | 2 584                           | -34   | CW                      |

NOTE <sup>1</sup>: OCBW is in Hz.

NOTE <sup>2</sup>: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE <sup>3</sup>: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

### Receiver Category 3 equipment

| Wanted signal mean power from companion device (dBm)<br>(see notes 1 and 3)                            | Blocking signal frequency(MHz) | Blocking signal power (dBm)<br>(see note 3) | Type of blocking signal |
|--|--------------------------------|---|-------------------------|
| (-139 dBm + 10 × log <sub>10</sub> (OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2) | 2 380                          | -34   | CW                      |
|  | 2 504                          | -34   | CW                      |
|  | 2 300                          | -34   | CW                      |
|  | 2 584                          | -34   | CW                      |

NOTE <sup>1</sup>: OCBW is in Hz.

NOTE <sup>2</sup>: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE <sup>3</sup>: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Categorization

| Receiver category | Definition   |
|-------------------|--|
| 1                 | Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment.   |
| 2                 | Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment. |
| 3                 | Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment                                    |

#### 5.2.3.2 Test Setup

See the section 4.5.3 (Diagram 4) for test setup description. The photo of test setup please refer to ANNEX B.

#### 5.2.3.3 Test Procedure

Reference to ETSI EN 300 328 V2.2.2 clause 5.4.11.2.

#### 5.2.3.4 Test Result

Please refer to ANNEX A.12.

## 5.3 Other Parameters

### 5.3.1 Geo-location capability

#### 5.3.1.1 Requirements

The geographical location determined by the equipment as defined in following section (5.3.1.2) shall not be accessible to the user.

#### 5.3.1.2 Definition

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

#### 5.3.1.3 Test Result

Note: Not applicable.

## ANNEX A TEST RESULT

### A.1 RF output power

#### Test Data

Note: EIRP Power = Conducted Power + Antenna Gain

| Modulation Mode  |                 | O-QPSK      |                               |                |
|--|-----------------|-------------|-------------------------------|----------------|
| Limit  |                 | 20 dBm      |                               |                |
| Test Result  |                 |             |                               |                |
| Test Method  | Test Conditions |             | Transmitter Power Level (dBm) |                |
| <input type="checkbox"/> Radiated<br><input checked="" type="checkbox"/> Conducted | Voltage         | Temperature | Low Channel                   | Middle Channel |
|  |                 |             | EIRP                          | EIRP           |
|  |                 |             | NT                            | 9.6            |
|  |                 |             | LT                            | 9.7            |
|  | NV              | HT          | 9.2                           | 9.4            |
| Test Verdict   |                 |             | Pass                          |                |

Bursts Power List

O-QPSK: Low Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on    | Tx_off |
|-----------------|------------|-----------|----------|--------|
| dBm             | ms         | ms        | ms       | ms     |
| 9.7             | 0.000      | 1000.000  | 1000.000 | 0.000  |

O-QPSK: Middle Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on    | Tx_off |
|-----------------|------------|-----------|----------|--------|
| dBm             | ms         | ms        | ms       | ms     |
| 9.4             | 0.000      | 1000.000  | 1000.000 | 0.000  |

O-QPSK: High Channel

| Burst RMS Power | Start Time | Stop Time | Tx_on    | Tx_off |
|-----------------|------------|-----------|----------|--------|
| dBm             | ms         | ms        | ms       | ms     |
| 9.8             | 0.000      | 1000.000  | 1000.000 | 0.000  |

## A.2 Power spectral density

### Measuring Parameter

| Frequency Range        |               |          |
|------------------------|---------------|----------|
| 2400 MHz to 2483.5 MHz | RBW (MHz)     | 10 kHz   |
|                        | VBW (MHz)     | 30 kHz   |
|                        | Sweep points  | 8351     |
|                        | Detector mode | RMS      |
|                        | Trace mode    | Max Hold |
|                        | Sweep time    | Auto     |

### Test Data

Note: The Power density is EIRP Power density, which is contain antenna gain.

| Modulation Mode           |                 | O-QPSK     |                         |                        |
|---------------------------|-----------------|------------|-------------------------|------------------------|
| Limit                     |                 | 10 dBm/MHz |                         |                        |
| Test Result               |                 |            |                         |                        |
| Test Method               | Test Conditions |            | Power density (dBm/MHz) |                        |
|                           | Temperature     | Voltage    | Low Channel             | Middle Channel         |
|                           |                 |            | Power Spectral density  | Power Spectral density |
| ☐ Radiated<br>☒ Conducted | NT              | NV         | 8.32                    | 8.13                   |
| Test Verdict              |                 | Pass       |                         |                        |

### A.3 Duty Cycle, Tx-sequence, Tx-gap

Note <sup>1</sup>: The maximum value of Duty Cycle declared by the supplier.

Test Data

| Duty Cycle (%) | Limit Duty Cycle (%) <sup>Note1</sup> | Number of Bursts | Minimum Tx-On (ms) | Maximum Tx-On (ms) | Minimum Tx-Off (ms) | Maximum Tx-Off (ms) | Measurement Time (ms) | Comment |
|----------------|---------------------------------------|------------------|--------------------|--------------------|---------------------|---------------------|-----------------------|---------|
| --             | --                                    | --               | --                 | --                 | --                  | --                  | --                    | --      |

Note <sup>2</sup>: Not applicable.

### A.4 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Note: Not applicable.

### A.5 Hopping Frequency Separation

Note: Not applicable.

### A.6 Medium Utilization (MU) factor

| Medium Utilization (MU) (%) | Limit Medium Utilization (MU) (%) | Verdict |
|-----------------------------|-----------------------------------|---------|
| --                          | 10                                | --      |

Note: Not applicable.

### A.7 Adaptivity

Note: Not applicable.

## A.8 Occupied Channel Bandwidth

### Measuring Parameter

|                  |  |
|------------------|--|
| Centre Frequency | The centre frequency of the channel under test                                     |
| RBW              | ~ 1 % of the span without going below 1 %  |
| VBW              | 3 × RBW  |
| Span             | 2 × Nominal Channel Bandwidth  |
| Detector mode    | RMS  |
| Trace mode       | Max Hold   |
| Sweep time       | Auto   |
| Test Method      | <input type="checkbox"/> Radiated<br><input checked="" type="checkbox"/> Conducted |

### Test Data

| Test Conditions |         | Test Mode | DUT Frequency (MHz) | Occupied Channel Bandwidth (MHz) | Lower Band Edge (MHz) | Upper Band Edge (MHz) | Limit (MHz)                            |
|-----------------|---------|-----------|---------------------|----------------------------------|-----------------------|-----------------------|--|
| Temperatu re    | Voltage |           |                     |                                  |                       |                       |  |
| NT              | NV      | O-QPSK    | 2402                | 1.993                            | 2404.006592           | 2405.999592           | Within The Band 2400 MHz to 2483.5 MHz |
|                 |         |           | 2480                | 2.087                            | 2478.959961           | 2481.046961           |  |
| Test Verdict    |         | Pass      |                     |                                  |                       |                       |  |

### Test Plots

O-QPSK: Low Channel



O-QPSK: High Channel



## A.9 Transmitter unwanted emissions in the out-of-band domain

### Test Data

#### O-QPSK

| DUT Frequency (MHz) | Nominal Bandwidth (MHz) | Frequency (MHz) | Level (dBm) | Limit (dBm) | Result |
|---------------------|-------------------------|-----------------|-------------|-------------|--------|
| 2405                | 1.993                   | 2396.5          | -31.189     | -20         | Pass   |
| 2405                | 1.993                   | 2397.5          | -28.458     | -20         | Pass   |
| 2405                | 1.993                   | 2398.5          | -25.341     | -10         | Pass   |
| 2405                | 1.993                   | 2399.5          | -19.463     | -10         | Pass   |
| 2480                | 2.087                   | 2484.0          | -18.961     | -10         | Pass   |
| 2480                | 2.087                   | 2485.0          | -23.888     | -10         | Pass   |
| 2480                | 2.087                   | 2486.0          | -29.812     | -20         | Pass   |
| 2480                | 2.087                   | 2487.0          | -30.672     | -20         | Pass   |

## A.10 Transmitter unwanted emissions in the spurious domain

Note <sup>1</sup>: The test method choose the conducted method. Which power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation).

Note <sup>2</sup>: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

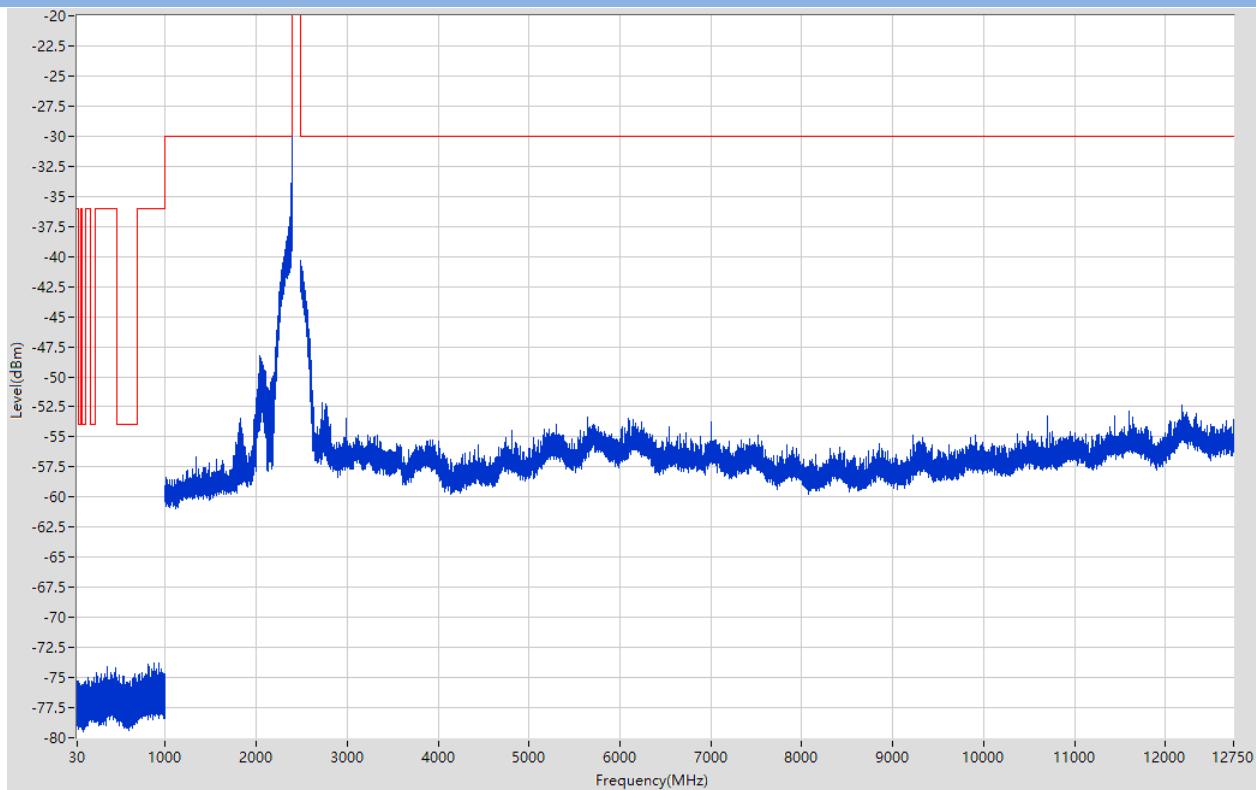
Note <sup>3</sup>: The cabinet radiated test data is tested in the normal working mode of the product.

### Measuring Parameter

| Frequency Range     |               |          |
|---------------------|---------------|----------|
| 30 MHz to 1 000 MHz | RBW (MHz)     | 100 kHz  |
|                     | VBW (MHz)     | 300 kHz  |
|                     | Sweep points  | 19400    |
|                     | Detector mode | Peak     |
|                     | Trace mode    | Max Hold |
| 1 GHz to 12,75 GHz  | RBW (MHz)     | 1 MHz    |
|                     | VBW (MHz)     | 3 MHz    |
|                     | Sweep points  | 23500    |
|                     | Detector mode | Peak     |
|                     | Trace mode    | Max Hold |

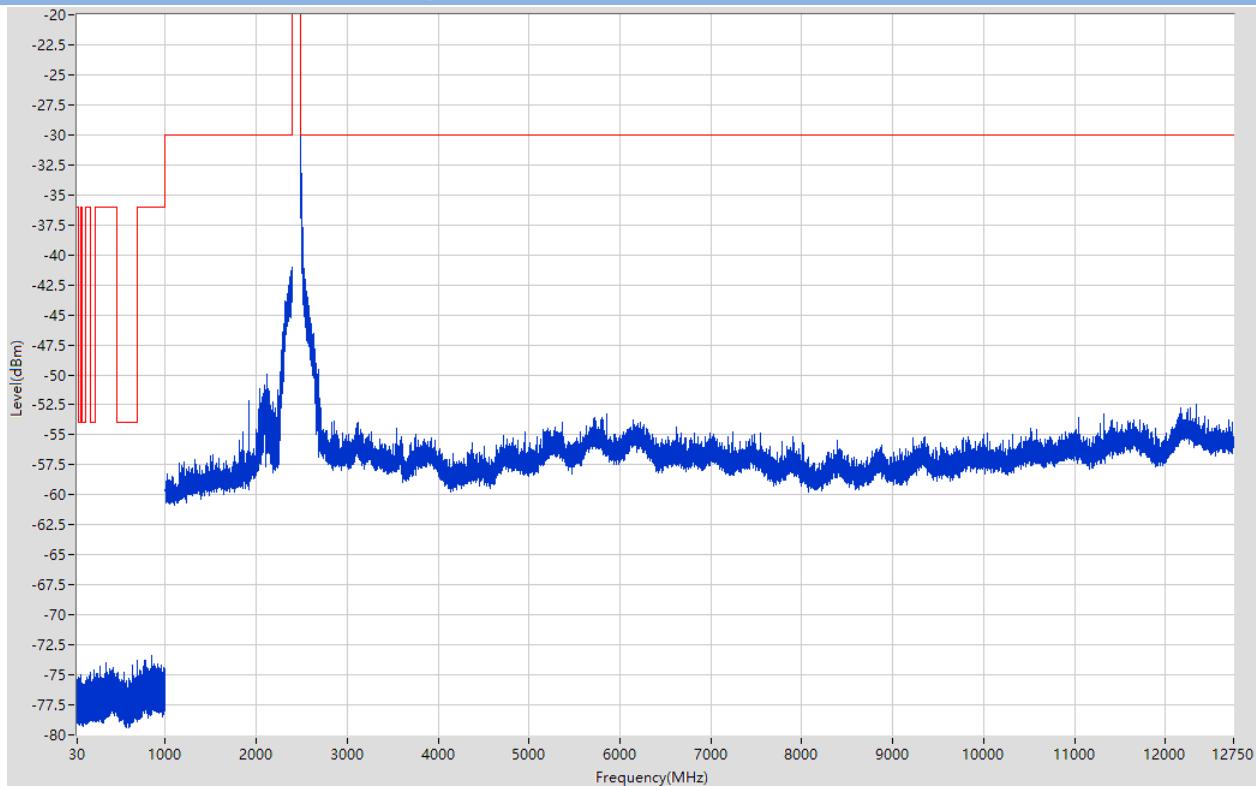
Conducted Test Data

O-QPSK 30 MHz to 12.75 GHz, Low channel



| Start Frequency (MHz) | Stop Frequency (MHz) | RBW (MHz) | Detector | Frequency (MHz) | Power (dBm) | Limit (dBm) | Verdict | Sweep Point |
|-----------------------|----------------------|-----------|----------|-----------------|-------------|-------------|---------|-------------|
| 30                    | 47                   | 0.1       | Peak     | 43.685          | -75.3       | -36         | Pass    | 401         |
| 47                    | 74                   | 0.1       | Peak     | 53.9            | -75.46      | -54         | Pass    | 541         |
| 74                    | 87.5                 | 0.1       | Peak     | 86.724          | -75.58      | -36         | Pass    | 401         |
| 87.5                  | 118                  | 0.1       | Peak     | 115.35          | -75.42      | -54         | Pass    | 611         |
| 118                   | 174                  | 0.1       | Peak     | 152.55          | -75.02      | -36         | Pass    | 1121        |
| 174                   | 230                  | 0.1       | Peak     | 218.3           | -75.04      | -54         | Pass    | 1121        |
| 230                   | 470                  | 0.1       | Peak     | 362.4           | -74.13      | -36         | Pass    | 4801        |
| 470                   | 694                  | 0.1       | Peak     | 661.9           | -74.71      | -54         | Pass    | 4481        |
| 694                   | 1000                 | 0.1       | Peak     | 874.2           | -73.82      | -36         | Pass    | 6121        |
| 1000                  | 2398                 | 1         | Peak     | 2397.5          | -26.76      | -30         | N/A     | 2797        |
|                       |                      |           | RMS      |                 | -47.61      |             | Pass    | 30000       |
| 2485.5                | 12750                | 1         | Peak     | 2488            | -40.34      | -30         | Pass    | 20530       |

## O-QPSK 30 MHz to 12.75 GHz, High channel

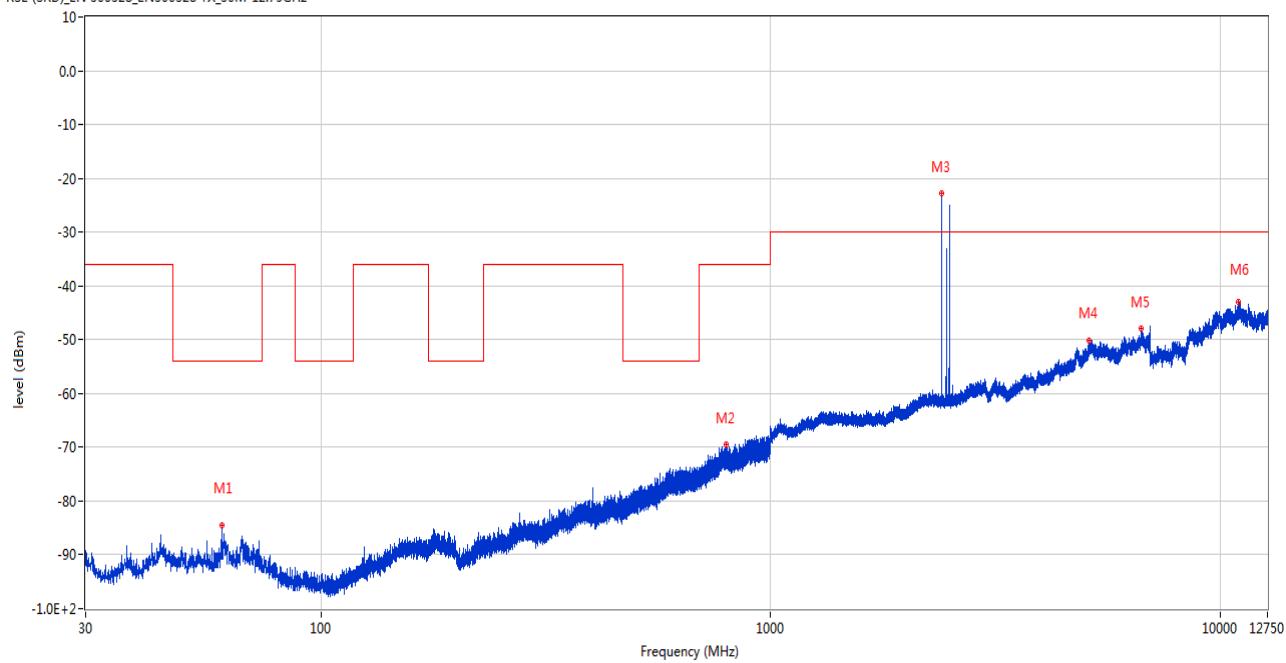


| Start Frequency (MHz) | Stop Frequency (MHz) | RBW (MHz) | Detector | Frequency (MHz) | Power (dBm) | Limit (dBm) | Verdict | Sweep Point |
|-----------------------|----------------------|-----------|----------|-----------------|-------------|-------------|---------|-------------|
| 30                    | 47                   | 0.1       | Peak     | 40.2            | -75.17      | -36         | Pass    | 401         |
| 47                    | 74                   | 0.1       | Peak     | 68.3            | -74.95      | -54         | Pass    | 541         |
| 74                    | 87.5                 | 0.1       | Peak     | 75.046          | -75.37      | -36         | Pass    | 401         |
| 87.5                  | 118                  | 0.1       | Peak     | 116.4           | -75.69      | -54         | Pass    | 611         |
| 118                   | 174                  | 0.1       | Peak     | 162.05          | -75.09      | -36         | Pass    | 1121        |
| 174                   | 230                  | 0.1       | Peak     | 208.5           | -74.59      | -54         | Pass    | 1121        |
| 230                   | 470                  | 0.1       | Peak     | 351.5           | -73.95      | -36         | Pass    | 4801        |
| 470                   | 694                  | 0.1       | Peak     | 642.75          | -74.18      | -54         | Pass    | 4481        |
| 694                   | 1000                 | 0.1       | Peak     | 853.2           | -73.36      | -36         | Pass    | 6121        |
| 1000                  | 2398                 | 1         | Peak     | 2397            | -41.06      | -30         | Pass    | 2797        |
| 2485.5                | 12750                | 1         | Peak     | 2487.5          | -26.72      | -30         | N/A     | 20530       |
|                       |                      |           | RMS      |                 | -47.74      |             | Pass    | 30000       |

Cabinet Radiated Test Data

30 MHz to 12.75 GHz, ANT H

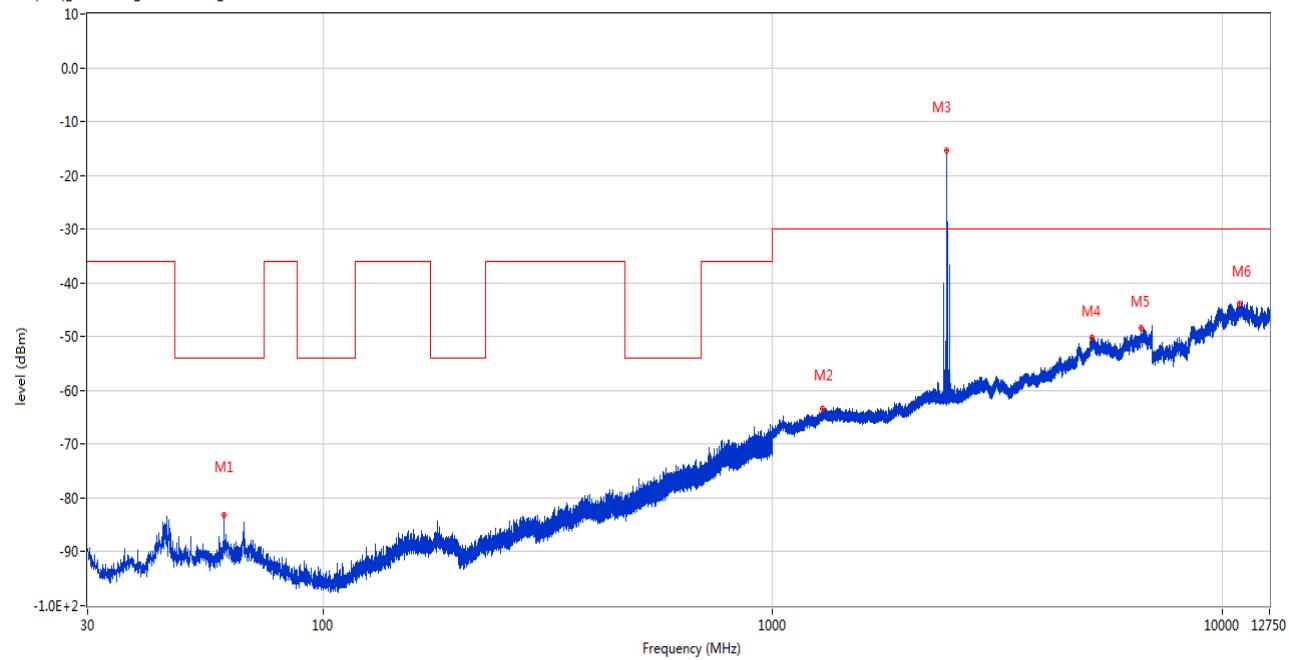
RSE (SRD)\_EN\_300328\_EN300328\_TX\_30M-12.75GHz



| Frequency (MHz) | Result (dBm) | Factor (dB) | PK Limit (dBm) | Over Limit (dB) | Table (o) | ANT        | EUT        | Verdict |
|-----------------|--------------|-------------|----------------|-----------------|-----------|------------|------------|---------|
| 60.264          | -84.54       | -16.88      | -54.0          | -30.54          | 271.00    | Horizontal | Horizontal | Pass    |
| 799.113         | -69.39       | 2.07        | -36.0          | -33.39          | 308.00    | Horizontal | Horizontal | Pass    |
| 2403.400        | -22.73       | -0.90       | -30.0          | 7.27            | 35.00     | Horizontal | Horizontal | N/A     |
| 5124.400        | -50.27       | 10.84       | -30.0          | -20.27          | 282.00    | Horizontal | Horizontal | Pass    |
| 6688.400        | -47.86       | 12.54       | -30.0          | -17.86          | 63.00     | Horizontal | Horizontal | Pass    |
| 10981.588       | -43.06       | 18.97       | -30.0          | -13.06          | 89.00     | Horizontal | Horizontal | Pass    |

## 30 MHz to 12.75 GHz, ANT V

RSE (SRD)\_EN\_300328\_EN300328\_TX\_30M-12.75GHz



| Frequency (MHz) | Result (dBm) | Factor (dB) | PK Limit (dBm) | Over Limit (dB) | Table (o) | ANT      | EUT        | Verdict |
|-----------------|--------------|-------------|----------------|-----------------|-----------|----------|------------|---------|
| 60.264          | -83.14       | -16.88      | -54.0          | -29.14          | 222.00    | Vertical | Horizontal | Pass    |
| 1294.500        | -63.42       | -4.27       | -30.0          | -33.42          | 195.00    | Vertical | Horizontal | Pass    |
| 2443.400        | -15.39       | -1.43       | -30.0          | 14.61           | 323.00    | Vertical | Horizontal | N/A     |
| 5152.000        | -50.18       | 10.42       | -30.0          | -20.18          | 223.00    | Vertical | Horizontal | Pass    |
| 6611.000        | -48.45       | 12.21       | -30.0          | -18.45          | 360.00    | Vertical | Horizontal | Pass    |
| 10934.150       | -43.89       | 19.28       | -30.0          | -13.89          | 0.00      | Vertical | Horizontal | Pass    |

## A.11 Receiver Spurious Emissions

Note <sup>1</sup>: The test method choose the conducted method. Which power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation).

Note <sup>2</sup>: The Frequency band was pre-scanned, the harmonic and other spurious which worst frequency are recorded in the report.

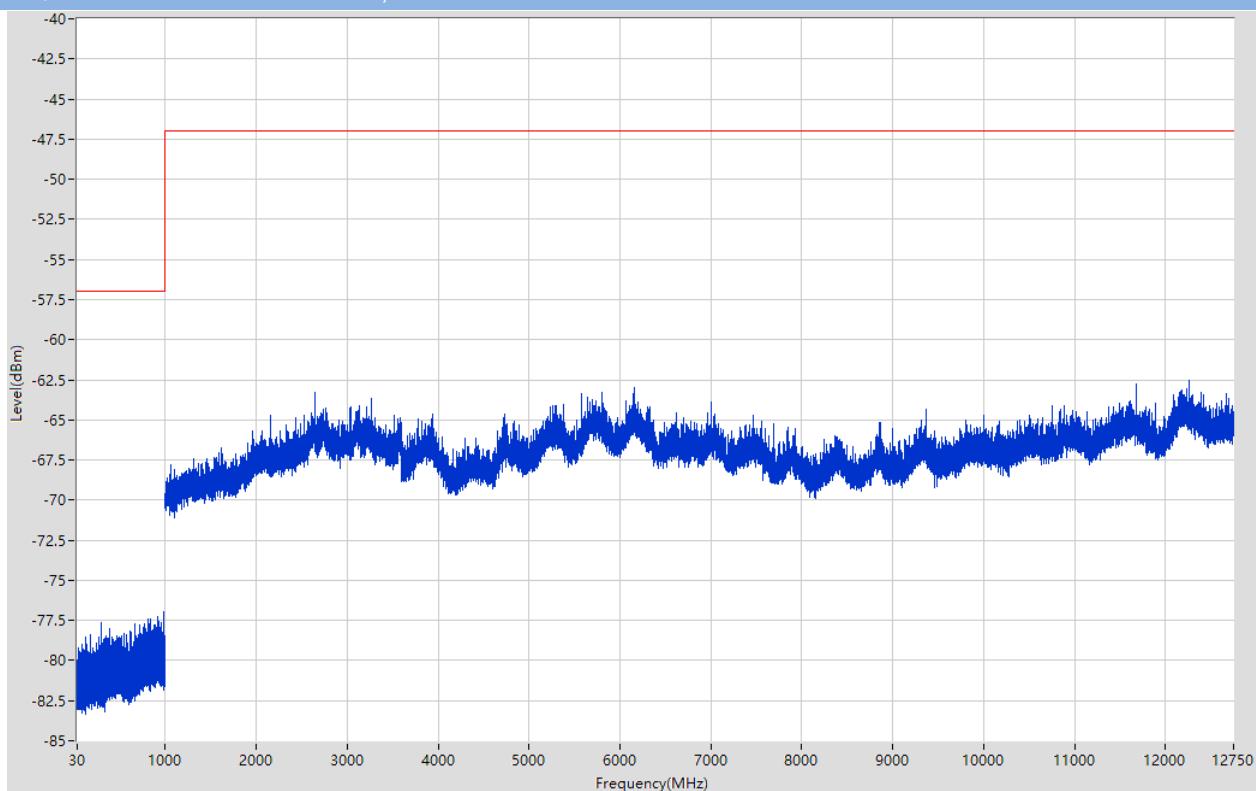
Note <sup>3</sup>: The cabinet radiated test data is tested in the normal working mode of the product.

### Measuring Parameter

| Frequency Range     |               |          |
|---------------------|---------------|----------|
| 30 MHz to 1 000 MHz | RBW (MHz)     | 100 kHz  |
|                     | VBW (MHz)     | 300 kHz  |
|                     | Sweep points  | 19400    |
|                     | Detector mode | Peak     |
|                     | Trace mode    | Max Hold |
| 1 GHz to 12,75 GHz  | RBW (MHz)     | 1 MHz    |
|                     | VBW (MHz)     | 3 MHz    |
|                     | Sweep points  | 23500    |
|                     | Detector mode | Peak     |
|                     | Trace mode    | Max Hold |

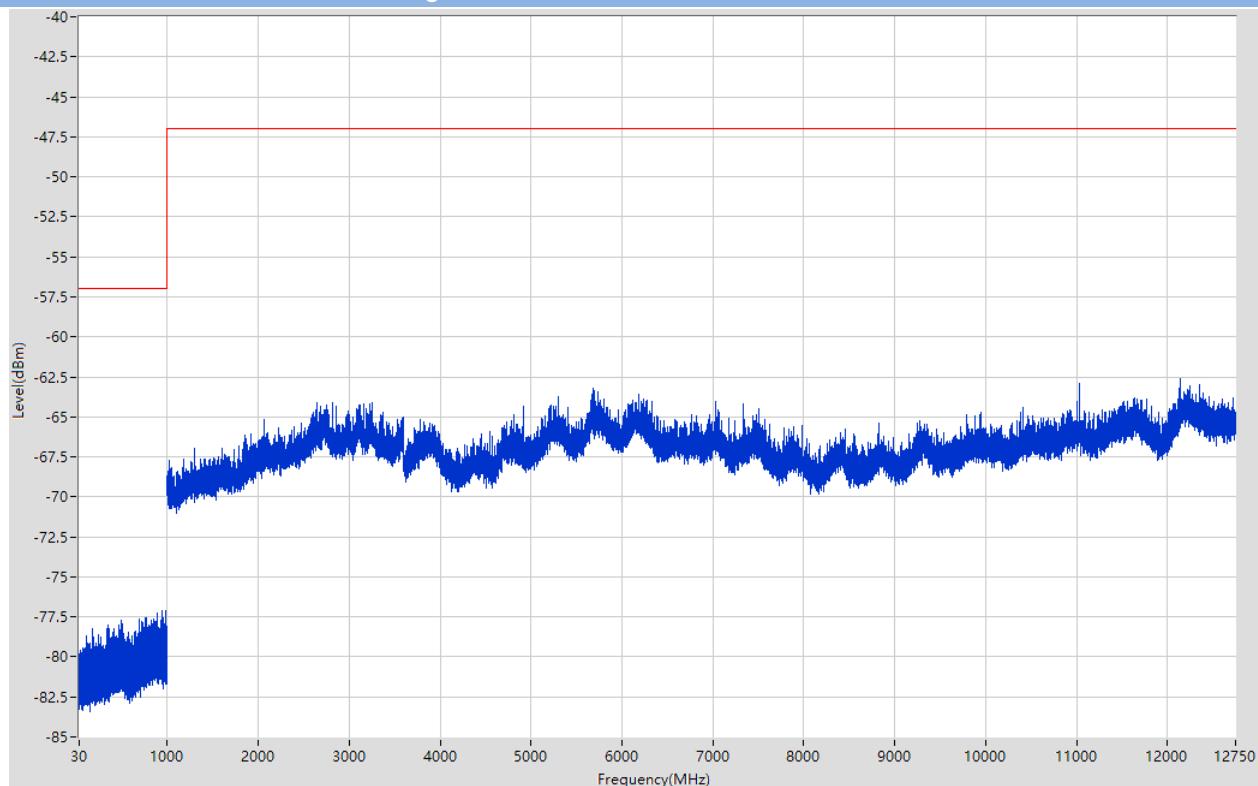
Conducted Test Data

O-QPSK 30 MHz to 12.75 GHz, Low channel



| Start Frequency (MHz) | Stop Frequency (MHz) | RBW (MHz) | Detector | Frequency (MHz) | Power (dBm) | Limit (dBm) | Verdict | Sweep Point |
|-----------------------|----------------------|-----------|----------|-----------------|-------------|-------------|---------|-------------|
| 30                    | 1000                 | 0.1       | Peak     | 986.7           | -76.99      | -57         | Pass    | 19401       |
| 1000                  | 12750                | 1         | Peak     | 12261           | -62.55      | -47         | Pass    | 23501       |

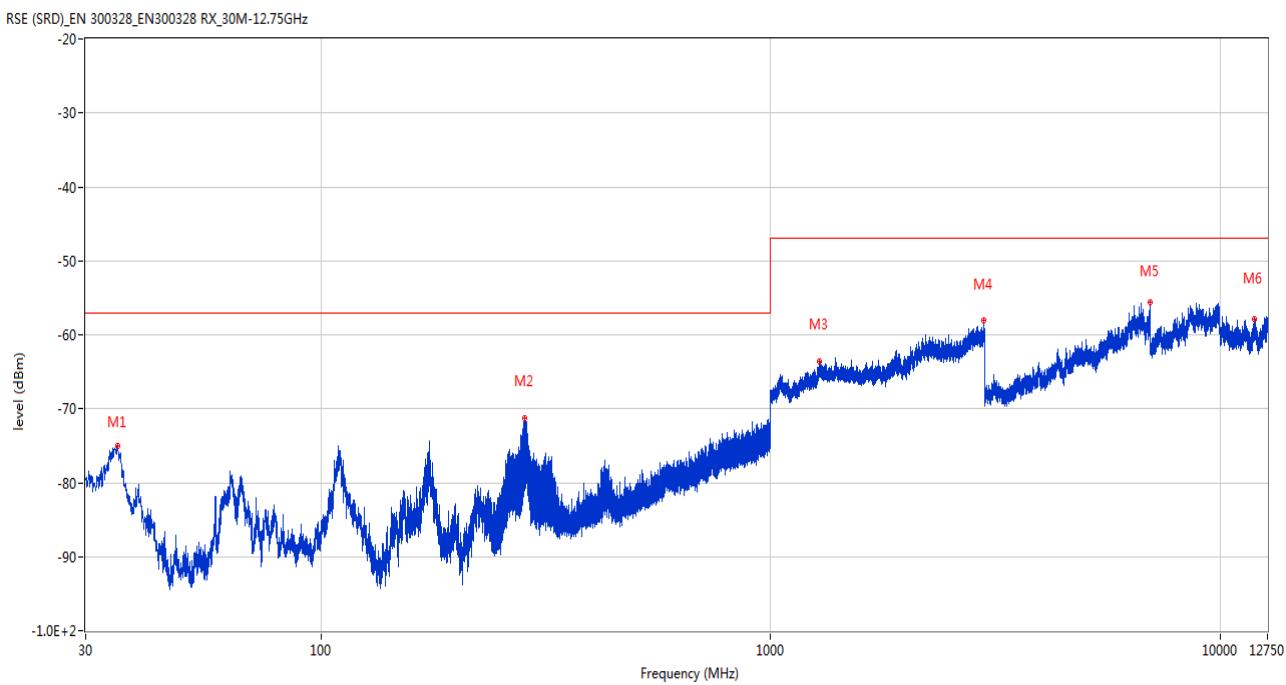
## O-QPSK 30 MHz to 12.75 GHz, High channel



| Start Frequency (MHz) | Stop Frequency (MHz) | RBW (MHz) | Detector | Frequency (MHz) | Power (dBm) | Limit (dBm) | Verdict | Sweep Point |
|-----------------------|----------------------|-----------|----------|-----------------|-------------|-------------|---------|-------------|
| 30                    | 1000                 | 0.1       | Peak     | 985             | -77.09      | -57         | Pass    | 19401       |
| 1000                  | 12750                | 1         | Peak     | 12136.5         | -62.6       | -47         | Pass    | 23501       |

Cabinet Radiated Test Data

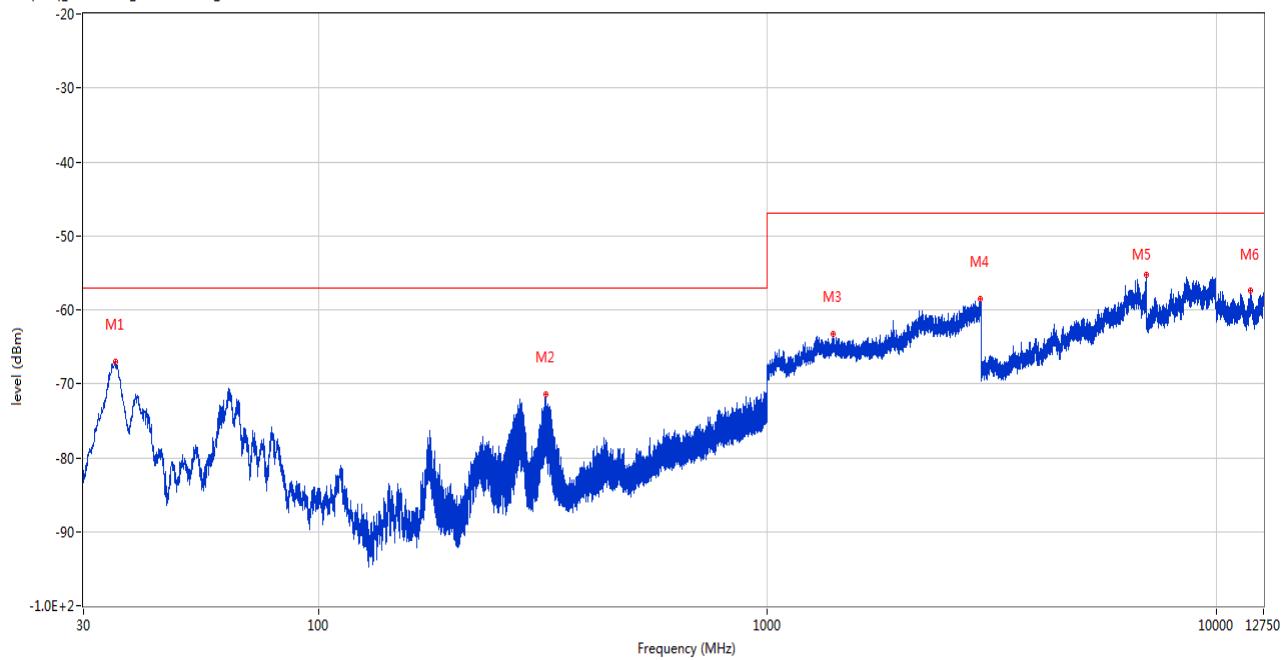
30 MHz to 12.75 GHz, ANT H



| Frequency (MHz) | Result (dBm) | Factor (dB) | PK Limit (dBm) | Over Limit (dB) | Table (o) | ANT        | EUT        | Verdict |
|-----------------|--------------|-------------|----------------|-----------------|-----------|------------|------------|---------|
| 35.286          | -74.95       | -18.46      | -57.0          | -17.95          | 90.00     | Horizontal | Horizontal | Pass    |
| 283.898         | -71.30       | -11.76      | -57.0          | -14.30          | 176.00    | Horizontal | Horizontal | Pass    |
| 1288.100        | -63.58       | -4.55       | -47.0          | -16.58          | 213.00    | Horizontal | Horizontal | Pass    |
| 2987.900        | -58.09       | 1.96        | -47.0          | -11.09          | 13.00     | Horizontal | Horizontal | Pass    |
| 6992.800        | -55.58       | 5.91        | -47.0          | -8.58           | 14.00     | Horizontal | Horizontal | Pass    |
| 11945.862       | -57.95       | 5.22        | -47.0          | -10.95          | 215.00    | Horizontal | Horizontal | Pass    |

## 30 MHz to 12.75 GHz, ANT V

RSE (SRD)\_EN 300328\_EN300328 RX\_30M-12.75GHz



| Frequency (MHz) | Result (dBm) | Factor (dB) | PK Limit (dBm) | Over Limit (dB) | Table (o) | ANT      | EUT        | Verdict |
|-----------------|--------------|-------------|----------------|-----------------|-----------|----------|------------|---------|
| 35.286          | -66.96       | -18.46      | -57.0          | -9.96           | 35.00     | Vertical | Horizontal | Pass    |
| 321.776         | -71.40       | -11.55      | -57.0          | -14.40          | 100.00    | Vertical | Horizontal | Pass    |
| 1403.700        | -63.28       | -4.47       | -47.0          | -16.28          | 104.00    | Vertical | Horizontal | Pass    |
| 2982.000        | -58.60       | 2.10        | -47.0          | -11.60          | 147.00    | Vertical | Horizontal | Pass    |
| 6980.600        | -55.29       | 6.11        | -47.0          | -8.29           | 252.00    | Vertical | Horizontal | Pass    |
| 11950.175       | -57.44       | 5.12        | -47.0          | -10.44          | 253.00    | Vertical | Horizontal | Pass    |

## A.12 Receiver Blocking

Note 1: The combination of the smallest channel bandwidth and the lowest data rate was reported.

Note 2: Blocking signal levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels corrected by the actual antenna assembly gain.

Note 3: During the Blocking test, the number of packets sent by the system is 1500

### Test Data

#### Receiver Category 2 equipment

| Wanted signal mean power from companion device (dBm)   | Blocking signal Frequency (MHz) | Blocking signal power (dBm)<br>(see note 2) | PER Result  |              | Limit | Verdict |
|--|---------------------------------|---|-------------|--------------|-------|---------|
|  |                                 |   | Low channel | High channel |       |         |
| (-139 dBm + 10 × log <sub>10</sub> (OCBW) + 10 dB) or (-74 dBm + 10 dB)<br>whichever is less | 2 380                           | -34   | 0.00%       | 0.00%        | ≤10%  | Pass    |
|  | 2 504                           | -34   | 0.00%       | 0.00%        |       |         |
|  | 2 300                           | -34   | 0.00%       | 0.00%        |       |         |
|  | 2 584                           | -34   | 0.00%       | 0.00%        |       |         |

### Test Plot (PER)

Note: All the configuration were tested, but only the worst PER Plot were reported in this report.

Low Channel

High Channel

{RxCount: 1000}

{RxCount: 1000}

## **ANNEX B TEST SETUP PHOTOS**

Please refer the document "BL-SZ21C0869-AR.pdf".

## **ANNEX C EUT EXTERNAL PHOTOS**

Please refer the document "BL-SZ21C0869-AW.pdf".

## **ANNEX D EUT INTERNAL PHOTOS**

Please refer the document "BL-SZ21C0869-AI.pdf".

--END OF REPORT--